

REMARKS

By this amendment, claims 1, 7, 10, 13, 17, 23 and 27 have been amended, and claims 28 and 29 have been added. Thus, claims 1-29 are now active in the application. Reexamination and reconsideration of the application are respectfully requested.

In items 6 and 7 on pages 2 and 3 of the Office Action, claims 1-5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmermann (U.S. 5,523,684) in view of Yoshida (U.S. 4,351,515). This rejection is respectfully traversed, and is believed clearly inapplicable to claim 1 as now amended, for the following reasons.

With exemplary reference to Fig. 1, claim 1 sets forth a piston rod piston detecting mechanism for detecting the position of a piston rod 13 connected to a piston 12 slidably mounted in a cylinder 11 having both ends thereof closed (e.g. by end walls 11a, 11b), the mechanism comprising a magnetic circuit including a detecting coil 17 provided at one end of the cylinder 11 from which the piston rod 13 protrudes out of the cylinder 11, and a flange 14 provided on the piston rod 13 opposite to the detecting coil 17, wherein the detecting coil 17 and the flange 14 are arranged such that movement of the flange 14, and thus the piston rod 13, relative to the detecting coil 17 causes a change in inductance in the magnetic circuit which causes a change in an output signal from the detecting coil 17, and wherein a detecting circuit 19 is provided for receiving the output signal from the detecting coil 17 to detect the position of the piston rod 13 based on the output signal.

Thus, according to the present invention as clearly recited now in claim 1, movement of the flange 14 upon movement of the piston rod 13 causes a change in inductance of the magnetic circuit comprised by the detecting coil 17 and the flange 14. This change in inductance of the magnetic circuit causes a change in the output signal (e.g. the current or voltage) from the detecting coil 17. The detecting circuit 19 receives the output signal from the output detecting coil to detect the position of the piston rod 13 based on the output signal from the detecting coil 17.

In contrast to the present invention of claim 1, the Zimmermann patent is directed to an electronic solenoid constituted as an electromagnetic actuator 100 having a plunger 105, wherein a pull coil 110 and a hold coil 115 are energized (by an outside current) to cause retraction (in the downward direction in Fig 1. of Zimmermann) and holding of the plunger 105 in the position shown

in Fig. 1 of Zimmermann. Specifically, the pull coil 110 and the hold coil 115 of Zimmermann are both energized in order to move the plunger 105 against the return spring 120 in the downward direction to contact against the pull piece 117. Once the plunger 105 has contacted the pull piece 117, the pull coil 110 is deenergized, but the hold coil 115 remains energized to retain the plunger 105 in its lowered position as shown in Fig. 1 of Zimmermann. Upon deenergization of the hold coil 115, the return spring 120 pulls the plunger 105 upwardly away from the pull piece 117. A sensing device 125 is provided to detect "the magnetic flux density produced by the coils [110, 115] and responsively produces a position signal having a magnitude responsive to the position of the plunger [105]" (see column 2, lines 9-12). However, the sensing device 125 of Zimmermann detects the magnetic flux density produced by the coils 110, 115 when the coils 110, 115 are energized by an outside current for the purpose of pulling and holding the plunger 105 to its lowered position shown in Fig. 1 of Zimmermann. However, movement of the plunger 105 does not cause a change in an output signal from the coils 110, 115 of Zimmermann, as is required by claim 1. Rather, it is energization of the coils 110, 115 that causes movement of the plunger 105. Thus, the sensor 125 senses change in the magnetic flux density caused by energization of the coils 110, 115 by an outside current source. In contrast, in the present invention, movement of the flange 14 relative to the detecting coil 17 causes a change in the inductance of the magnetic circuit comprising the detecting coil 17 and the flange 14, which causes a change in an output signal from the detecting coil 17. This change in the output signal from the detecting coil is detected by the detecting circuit 19 so as to detect the position of the piston rod 13 based on the output signal.

To summarize, claim 1 requires that the movement of the flange 14 relative to the detecting coil 17 causes a change in inductance in the magnetic circuit, which causes a change in an output signal from the detecting coil. In the Zimmermann arrangement, on the other hand, the movement of the flange secured to the top end of the plunger 105 does not cause a change in a magnetic circuit comprised of the top-end flange and the coil 110 and/or 115, which causes a change in an output signal from the coil 110 and/or 115. Rather, in Zimmermann, energization of the coils 110, 115 by an outside current causes movement of the plunger 105 and thus the top-end flange thereof. The

sensing device 125 senses the magnetic flux density produced by the coils upon energization thereof by the outside current.

The Yoshida patent was cited by the Examiner for allegedly teaching "to modify the device of Zimmermann so that the coil is at the outer end of the cylinder... in order to accurately measure the movements and the position of the piston rod and to be able to replace the coil without dismantling the system." However, this alleged teaching of the Yoshida patent clearly provides no teaching or suggestion that would have obviated the above-discussed shortcomings of the Zimmermann patent.

Thus, because of the above-discussed clear distinctions between the present invention of claim 1 and the Zimmermann and Yoshida patents, it is believed apparent that the present invention of claim 1 is not taught or suggested by the Zimmermann and Yoshida patents either taken individually or in combination. Therefore, it is respectfully submitted that claim 1, as well as claims 2-17, 28 and 29 which depend therefrom, are clearly allowable over the prior art of record.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is earnestly solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, it is respectfully requested that the Examiner contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

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